

CLAIMS

What is claimed is:

1. A method for preparing a composite by spray up operation, comprising the steps of:

- applying a gel coat into a mold;
- applying a barrier coat over the gel coat; and
- applying a laminate formula over the barrier coat,

wherein the laminate formula comprises 40-80% by weight paste and 20-60% by weight reinforcing fibers, wherein the paste comprises 70% or more by weight resin, up to 25% by weight filler, and an initiator composition;

wherein the resin comprises an unsaturated polyester resin curable at a temperature of 50°C or lower; the filler comprises particles having a density lower than that of the resin, and the initiator composition contains an optional promoter or accelerator, the initiator composition being capable of initiating cure of the resin at a temperature of 50°C or lower.

2. A method according to claim 1, wherein the gel coat is 0.2-2 mm thick, the barrier coat is 0.5-5 mm thick, and the laminate is 1-10 mm thick.

3. A method according to claim 1, wherein the thickness of the composite is from 2-15 mm.

4. A method according to claim 1, wherein the composite is an automobile body panel.

5. A method according to claim 1, wherein the filler comprises glass hollow microspheres.

6. A method according to claim 1, wherein the filler comprises polymeric hollow microspheres.
7. A method according to claim 1, wherein the paste comprises 90% or more by weight resin and up to 5% by weight polymeric hollow microspheres.
8. A method according to claim 6, wherein the polymeric hollow microspheres are coated with calcium carbonate.
10. A laminate composition comprising a paste and filler, wherein the paste comprises,
 - a dicyclopentadiene unsaturated polyester resin;
 - polymeric hollow microspheres; and
 - an initiator composition capable of initiating curing at a temperature of 50°C or less,and wherein the filler comprises reinforcing fibers having a length greater than or equal about 6 mm.
11. A composition according to claim 10, wherein the reinforcing fibers comprise glass fibers having a length greater than or equal about 12 mm.
12. A composition according to claim 10, wherein the reinforcing fibers comprise glass fibers of weight approximately 25 mm.
13. A composition according to claim 10, wherein the paste comprises 90% or more by weight resin and up to 5% by weight polymeric hollow microspheres.
14. A composition according to claim 10, wherein the microspheres are coated with calcium carbonate.

15. A composition according to claim 10, wherein the density of the laminate layer after cure is 1.2 g/cm^3 or less.

16. A composite article comprising a gel coat layer, a laminate layer, and a barrier layer disposed between the gel coat and laminate, wherein the laminate layer comprises 40-80% by weight paste and 20-60% by weight reinforcing fibers, wherein the paste comprises

70% or more by weight of an unsaturated polyester resin curable at a temperature of 50°C or lower;

up to 25% of a filler comprising particles having a density lower than that of the resin; and

an initiator composition capable of initiating cure of the resin at a temperature of 50°C or lower.

17. A composite article according to claim 16, wherein the composite article comprises an automobile body panel.

18. An article according to claim 16, wherein the total thickness of the article is 2-12 mm.

19. An article according to claim 16, wherein the total thickness of the article is 3-8 mm, the thickness of the gel coat is 0.5-1.5 mm, the thickness of the barrier coat is 0.75-2 mm, and the thickness of the laminate layer is 1-5 mm.

20. An article according to claim 16, wherein the filler comprises polymeric hollow microspheres.

21. An article according to claim 16, wherein the laminate and the barrier layer comprise cured unsaturated polyester resins, and the gel coat comprises a cured thermoset resin.

22. An article according to claim 16, wherein the reinforcing fibers comprise glass fibers having a length of 6 mm or greater.
23. An article according to claim 22, wherein the glass fibers are greater than or equal to about 12 mm in length.
24. An article according to claim 22, wherein the glass fibers are about 25 mm long.
25. An article according to claim 16, wherein the laminate layer comprises a cured dicyclopentadiene unsaturated polyester resin.
26. An article according to claim 16, wherein the density of the laminate layer is 1.2 g/cm^3 or less.
27. An article according to claim 16, wherein the paste comprises 80% or more by weight resin and up to 10% by weight glass hollow microspheres.
28. An article according to claim 16, wherein the filler is selected from the group consisting of glass hollow microspheres, polymeric hollow microspheres, and mixtures thereof.
29. An article according to claim 16, wherein the paste comprises up to 5% by weight of polymeric hollow microspheres.

30. A method for making a multilayer composite, comprising the steps of:
applying a gel coat layer to a mold surface;
applying a barrier coat layer onto the gel coat in the mold;
hand laying a glass cloth on top of the barrier coat layer; and
applying a laminate resin composition to the glass cloth,
wherein the laminate resin composition comprises 70% or more by weight of an
unsaturated polyester resin and up to 25% by weight hollow microspheres.
31. A method according to claim 30, further comprising curing the composite
at a temperature of 50°C or less.
32. A method according to claim 30, further comprising curing the composite
at a temperature of 30°C or less.
33. A method according to claim 30, wherein the polyester resin comprises a
dicyclopentadiene polyester resin.
34. A method according to claim 30, wherein the laminate resin composition
comprises 90% or more by weight polyester resin and up to 5% by weight polymeric
hollow microspheres.
35. A method according to claim 34, wherein the polyester comprises a
dicyclopentadiene resin.
36. An automobile body panel, comprising a cured multilayer composite
article comprising:
a gel coat layer;
a laminate layer; and
a barrier layer disposed between the gel coat layer and the laminate layer,
wherein the laminate layer comprises reinforcing glass fibers in a matrix of a cured
polyester resin, wherein the matrix comprises up to 5% by weight of polymeric

hollow microspheres and the polyester resin comprises a dicyclopentadiene polyester resin.

37. A body panel according to claim 36, wherein the glass fibers are greater than or equal to about 12 mm in length.

38. An automobile body panel according to claim 36, wherein the maximum thickness of the body panel is about 6 mm.

39. An automobile body panel according to claim 36, wherein the maximum thickness of the body panel is about 4 mm.